7. 510(k) SUMMARY

APR 2 6 2006

Contact Information

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Date Prepared December 20, 2005

Product and Trade Name *C. DIFF QUIK CHEK*™

Classification 21 CFR 866.2660

Predicate Devices

- *C. difficile* Culture media such as cycloserine - cefoxitin fructose agar (CCFA) is available commercially from various sources.
- *C. DIFF CHEK*™ – *60* (K030992) - TECHLAB®, Inc. (Blacksburg, VA)
- *C. DIFF CHEK*™ – *30* (K030991) - TECHLAB®, Inc. (Blacksburg, VA)
- BD CULTURETTE™ CDT™ (K870864) - Becton, Dickinson and Company (Franklin Lakes, NJ)
- Triage® Micro *Clostridium difficile* Panel (K974881) - Biosite Incorporated (San Diego, CA)
- ImmunoCard® *C. difficile* EIA (K924979) - Meridian Bioscience, Inc. (Cincinnati, OH)

Intended Use

The *C. DIFF QUIK CHEK*™ test is a rapid membrane enzyme immunoassay for use as a screening test to detect *Clostridium difficile* antigen, glutamate dehydrogenase, in fecal specimens from persons suspected of having *C. difficile* disease. The test does not distinguish toxigenic from nontoxigenic strains of *C. difficile*. With the use of additional tests that detect *C. difficile* toxins, the test is to be used as an aid in the diagnosis of *C. difficile* disease. As with other *C. difficile* tests, results should be considered in conjunction with the patient history.

Device Description

The *C. DIFF QUIK CHEK*™ test uses antibodies specific for glutamate dehydrogenase (GDH) of *C. difficile*. The device contains a Reaction Window with two lines of immobilized antibodies. The test line ("T") contains antibodies against *C. difficile* GDH. The other, representing a control line ("C"), contains anti-IgG antibodies. The *Conjugate* consists of antibody to GDH coupled to horseradish peroxidase. To perform the test, the fecal specimen is diluted with *Diluent*, and *Conjugate* is added to the diluted sample. The diluted sample-

conjugate mixture is added to the Sample Well and the device is allowed to incubate at room temperature for 15 minutes. During the incubation, any GDH in the sample binds to antibody-peroxidase conjugate. The antigen-antibody complexes migrate through a filter pad to a membrane where they are captured by the immobilized anti-GDH antibody in the line. The Reaction Window is subsequently washed with *Wash Buffer*, followed by the addition of *Substrate*. After up to a 10-minute incubation, the "T" reaction is examined visually for the appearance of a blue line. A blue line indicates a positive test. A positive "C" reaction, indicated by a blue line, confirms that sample and all reagents were added in proper sequence and volume, that reagents were active at the time of performing the assay, and that proper sample migration occurred.

Comparative Information of Equivalent Devices

Characteristics	510(k) Numbers	Intended Use	Format	Materials	Target Population
C. DIFF QUIK CHEK™ test	Subject to this 510(k)	Detection of *C. difficile* organism in fecal specimens	Rapid membrane	Highly specific antibodies against *C. difficile* GDH	Persons suspected of having *C. difficile* disease
C. difficile Presumptive bacterial culture	Used before 1976, 510(k) not available.	Detection of *C. difficile* organism in fecal specimens	Bacterial culture	Specific selective media, CCFA[a] plates and CC BHI[b] broth	Persons suspected of having *C. difficile* disease
C. DIFF CHEK™ *- 60*	K030992	Detection of *C. difficile* organism in fecal specimens	ELISA	Highly specific antibodies against *C. difficile* GDH	Persons suspected of having *C. difficile* disease
C. DIFF CHEK™ *- 30*	K030991	Detection of *C. difficile* organism in fecal specimens	ELISA	Highly specific antibodies against *C. difficile* GDH	Persons suspected of having *C. difficile* disease
BD CULTURETTE™ CDT™	K870864	Detection of *C. difficile* organism in fecal specimens	Latex agglutination	Antibodies against *C. difficile* GDH and other proteins	Persons suspected of having *C. difficile* disease
Triage® Micro *C. difficile* Panel, GDH portion	K974881	Detection of *C. difficile* organism in fecal specimens	Flow through membrane test	Highly specific antibodies against *C. difficile* GDH	Persons suspected of having *C. difficile* disease
ImmunoCard® *C. difficile* EIA	K924979	Detection of *C. difficile* organism in fecal specimens	Lateral flow membrane test	Highly specific antibodies against *C. difficile* GDH	Persons suspected of having *C. difficile* disease

a, CCFA, cycloserine - cefoxitin fructose agar plates
b, CC-BHI, cycloserine - cefoxitin brain-heart infusion liquid media

Summary of Performance Data

Clinical Accuracy

The Tables below show a summary of the clinical performance of the *C. DIFF QUIK CHEK™* test. Results from 3 studies are included in the summary. The discrepant samples generated from the *C. DIFF QUIK CHEK™* test and the presumptive bacterial culture assay were resolved using a PCR assay, an ELISA for the antigen, or a membrane test for the antigen, as described in the individual studies. The protocols are included in Appendix A and D. The results show that the *C. DIFF QUIK CHEK™* test exhibited a correlation of 92.6% with presumptive bacterial culture. When discrepant results were resolved by PCR, the correlation was 96.9%.

Clinical Performance Comparing *C. DIFF QUIK CHEK™* Test to Presumptive Bacterial Culture

n=979	Presumptive Bacterial Culture positive	Presumptive Bacterial Culture negative
C. DIFF QUIK CHEK™ positive	206	56
C. DIFF QUIK CHEK™ negative	16	701

		95% Confidence Limits
Sensitivity	92.8%	88.3% - 95.7%
Specificity	92.6%	90.4% - 94.3%
Predictive Negative Value	97.8%	96.3% - 98.7%
Correlation	92.6%	91.7% - 93.4%

Twenty-nine of the 56 apparent false positive samples were positive by another GDH test, and were considered true positive. Twenty-seven remained false positive. Thirteen of the 16 apparent false negative samples were negative by another GDH test, and were considered true negative. Three remained false negative. The summary is presented below.

Clinical Performance of *C. DIFF QUIK CHEK™* Test versus Bacterial Culture Assay after Resolution by another GDH Test

n=979	Resolved Bacterial Culture positive	Resolved Bacterial Culture negative
C. DIFF QUIK CHEK™ positive	235	27
C. DIFF QUIK CHEK™ negative	3	714

		95% Confidence Limits
Predictive Negative Value	99.6%	98.7% - 99.9%
Correlation	96.9%	96.5% - 97.2%

Analytical Sensitivity

The test was consistently positive at a concentration of 0.4 ng/mL for GDH.

Cross-Reactivity

The specificity of the *C. DIFF QUIK CHEK*™ test was evaluated by examining the reactivity of a wide range of common intestinal bacteria and intestinal pathogens in the assay. For the analysis, the organisms were grown to early stationary phase (>10^8 CFU/ml). The viruses were from ATCC culture fluids. The cultures were diluted in (i) fecal specimens that were negative for *C. difficile* (Negative Fecal Specimens) or (ii) fecal specimens that were spiked with toxigenic *C. difficile* cell filtrate to give a positive reaction (Positive Fecal Specimens). The latter specimens were evaluated to determine if any of the common intestinal bacteria and pathogens exhibited any deleterious effects on a positive reaction in the *C. DIFF QUIK CHEK*™ test. The fecal specimens then were diluted in *Diluent* and tested in the *C. DIFF QUIK CHEK*™ test.

A summary of the results is shown in the tables on the following pages. All of the organisms tested were negative in the *C. difficile*-negative fecal specimens and had no effect on the reaction with *C. difficile*-positive fecal specimens.

Bacterium	Strain	Reaction in negative fecal specimen	Reaction in positive fecal specimen
Aeromonas hydrophila	ATCC 7965	-	+
Bacillus cereus	ATCC 14579	-	+
Bacillus subtilis	ATCC 6051	-	+
Bacteroides fragilis	VPI 13785	-	+
Campylobacter coli	ATCC 49941	-	+
Campylobacter fetus	ATCC 25936	-	+
Campylobacter jejuni	ATCC 29428	-	+
Candida albicans	ATCC 10231	-	+
Clostridium bifermentans	VPI 2012	-	+
Clostridium butyricum	VPI 8260	-	+
Clostridium perfringens, type A	VPI 3624	-	+
Clostridium septicum	VPI 1524	-	+
Clostridium sordellii	VPI 9048	-	+
Clostridium sordellii	VPI 7319	-	+
Clostridium sporogenes	VPI 9743	-	+
Enterococcus faecalis	ATCC 19433	-	+
Escherichia coli EIEC	SD67	-	+
Escherichia coli	ATCC 25922	-	+
Escherichia coli O157 H7	B1409	-	+
Escherichia coli ETEC	E 2348169	-	+
Klebsiella pneumoniae	ATCC 9997	-	+
Peptostreptococcus anaerobius	ATCC 27337	-	+
Proteus vulgaris	ATCC 6380	-	+
Pseudomonas aeruginosa	ATCC 9027	-	+

Bacterium	Strain	Reaction in negative fecal specimen	Reaction in positive fecal specimen
Salmonella typhimurium	ATCC 14029	-	+
Shigella dysenteriae	ATCC 12022	-	+
Shigella flexneri	ATCC 12122	-	+
Shigella sonnei	ATCC 11060	-	+
Staphylococcus aureus	ATCC 6358	-	+
Staphylococcus aureus (Cowans)	ATCC 12598	-	+
Staphylococcus epidermidis	VPI 13140	-	+
Vibrio parahaemolyticus	ATCC 17802	-	+
Yersinia enterocolitica	ATCC 9610	-	+

Culture fluids containing viruses were used as provided by the American Type Culture Collection. Each was diluted ca. 1:20 in the kit *Diluent* and tested according to the Package Insert. The titer of the fluids is shown in the table below.

Virus	TCID50 units (per 0.2 mL)	ATCC#	Reaction in negative fecal	Reaction in positive fecal
Adenovirus type 1	$10^{4.5}$	VR-1	-	+
Adenovirus type 2	$10^{6.5}$	VR-846	-	+
Adenovirus type 3	$10^{8.25}$	VR-3	-	+
Adenovirus type 5	$10^{6.75}$	VR-5	-	+
Adenovirus type 40	$10^{4.5}$	VR-931	-	+
Adenovirus type 41	$10^{4.5}$	VR-930	-	+
Human coronavirus	$10^{3.5}$	VR-740	-	+
Coxsackievirus B2	$10^{5.75}$	VR-29	-	+
Coxsackievirus B3	10^{5}	VR-30	-	+
Coxsackievirus B4	$10^{4.75}$	VR-184	-	+
Coxsackievirus B5	$10^{7.5}$	VR-185	-	+
Echovirus 9	$10^{4.5}$	VR-1050	-	+
Echovirus 11	10^{5}	VR-1052	-	+
Echovirus 18	10^{4}	VR-48	-	+
Echovirus 22	$10^{3.3}$	VR-1063	-	+
Echovirus 33	10^{5}	VR-582	-	+
Enterovirus type 68	10^{6}	VR-1076	-	+
Enterovirus type 69	$10^{4.3}$	VR-1077	-	+
Enterovirus type 70	$10^{5.5}$	VR-836	-	+
Enterovirus type 71	pending	VR-784	-	+

Interfering Substances

The following substances had no effect on test results, either with *C. difficile*-negative or *C. difficile*-positive fecal specimens, when present in fecal material in the concentrations indicated in the table.

Substance	Concentration	Reaction in negative fecal specimen	Reaction in positive fecal specimen
Hog gastric mucin	3.5% w/v	-	+
Human blood (O, Rh-)	40% v/v	-	+
Barium sulfate	5% w/v	-	+
Imodium®	5% w/v	-	+
Kaopectate®	5 mg/ml	-	+
Pepto-Bismol®	5% w/v	-	+
Steric/palmitic acid (fecal fats)	40% w/v	-	+
Metronidazole	0.25% w/v	-	+
Vancomycin	0.25% w/v	-	+

Reproducibility

A total of 8 fecal specimens, 6 positive and 2 negative, were coded to prevent identification and were sent to each of three independent laboratories for analysis using the *C. DIFF QUIK CHEK*™ test. The results from each laboratory were compared with in-house results. The results were consistent among the different locations, and exhibited a correlation of 100%. The positive specimens were confirmed to be positive and the negative specimens were confirmed to be negative at all sites using the *C. DIFF QUIK CHEK*™ test.

8. REFERENCES

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Public Health Service

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NOV 3 2006

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Re: k053572
Trade/Device Name: *C. DIFF QUIK CHEK*™
Regulation Number: 21 CFR 866.2660
Regulation Name: Microorganism Differentiation and Identification Device
Regulatory Class: Class I
Product Code: MCB
Dated: March 29, 2006
Received: March 30, 2006

Dear Dr. Lyerly:

This letter corrects our substantially equivalent letter of April 26, 2006.

We have reviewed your Section 510(k) premarket notification of intent to market the device referenced above and have determined the device is substantially equivalent (for the indications for use stated in the enclosure) to legally marketed predicate devices marketed in interstate commerce prior to May 28, 1976, the enactment date of the Medical Device Amendments or to devices that have been reclassified in accordance with the provisions of the Federal Food, Drug, and Cosmetic Act (Act) that do not require approval of a premarket approval (PMA). You may, therefore, market the device, subject to the general controls provisions of the Act. The general controls provisions of the Act include requirements for annual registration, listing of devices, good manufacturing practice, labeling, and prohibitions against misbranding and adulteration.

If your device is classified (see above) into either class II (Special Controls) or class III (PMA), it may be subject to additional controls. Existing major regulations affecting your device can be found in the Code of Federal Regulations, Title 21, Parts 800 to 898. In addition, FDA may publish further announcements concerning your device in the Federal Register.

Please be advised that FDA's issuance of a substantial equivalence determination does not mean that FDA has made a determination that your device complies with other requirements of the Act or any Federal statutes and regulations administered by other Federal agencies. You must comply with all the Act's requirements, including, but not limited to: registration and listing (21 CFR Part 807); labeling (21 CFR Part 801); good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820); and if applicable, the electronic product radiation control provisions (sections 531-542 of the Act); 21 CFR 1000-1050.

This letter will allow you to begin marketing your device as described in your Section 510(k) premarket notification. The FDA finding of substantial equivalence of your device to a legally marketed predicate device results in a classification for your device and thus, permits your device to proceed to the market.

If you desire specific information about the application of labeling requirements to your device, or questions on the promotion and advertising of your device, please contact the Office of In Vitro Diagnostic Device Evaluation and Safety at (240)276-0450. Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21CFR Part 807.97). Other general information on your responsibilities under the Act may be obtained from the Division of Small Manufacturers, International and Consumer Assistance at its toll-free number (800) 638-2041 or (301) 443-6597 or at its Internet address http://www.fda.gov/cdrh/dsma/dsmamain.html.

Sincerely yours,

Sally A. Hojvat, M.Sc., Ph.D.
Director
Division of Microbiology Devices
Office of *In Vitro* Diagnostic Device
Evaluation and Safety
Center for Devices and
Radiological Health

Enclosure

Indications for Use

510(k) Number (if known): k053572

Device Name: *C. DIFF QUIK CHEK* ™

Indications For Use: The *C. DIFF QUIK CHEK*™ test is a rapid membrane enzyme immunoassay for use as a screening test to detect *Clostridium difficile* antigen, glutamate dehydrogenase, in fecal specimens from persons suspected of having *C. difficile* disease. The test does not distinguish toxigenic from nontoxigenic strains of *C. difficile*. With the use of additional tests that detect *C. difficile* toxins, the test is to be used as an aid in the diagnosis of *C. difficile* disease. As with other *C. difficile* tests, results should be considered in conjunction with the patient history.
FOR *IN VITRO* DIAGNOSTIC USE.

Prescription Use X AND/OR Over-The-Counter Use _____
(Part 21 CFR 801 Subpart D) (21 CFR 807 Subpart C)

(PLEASE DO NOT WRITE BELOW THIS LINE-CONTINUE ON ANOTHER PAGE IF NEEDED)

Concurrence of CDRH, Office of In Vitro Diagnostic Devices (OIVD)

Division Sign-Off

Office of In Vitro Diagnostic Device
Evaluation and Safety

K053572